Force Protection for Distribution Based-Logistics in Asymmetric Warfare

A Monograph

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AY 04-05

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	052605	Monograph

4. TITLE AND SUBTITLE
Force Protection for Distribution Based Logistics in Asymmetric Warfare

5. FUNDING NUMBERS

6. AUTHOR(S)
MAJ Thomas M. Spenard

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

U.S. Army Command and General Staff College
School of Advanced Military Studies
250 Gibbon Ave.
Fort Leavenworth, KS 66027

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

U.S. Army Command and General Staff College
Fort Leavenworth, KS 66027

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE
A

13. ABSTRACT ***(Maximum 200 Words)***

United States military operations in Iraq and Afghanistan demonstrate that adversaries are likely to persist in seeking advantage through asymmetric warfare. Within this context, emerging doctrine on Network Centric Warfare (NCW) and Effects Based Operations (EBO) must realistically apply to the U.S. Army, and more specifically, to Combat Service Support (CSS) leaders on the battlefield. In light of emerging doctrine, this monograph proposes necessary adaptations to force protection for Distribution-Based Logistics (DBL) under conditions of asymmetric warfare. Building on experience from Vietnam and contemporary operations in Iraq, this study examines the anticipated impact of the Joint Operational Environment (JOE) on CSS operations, including the key issue of tactical distribution. Among its conclusions, this study argues that the Army must insure that CSS leaders in the field have the ability to gain the required situational awareness to support and sustain the tactical commander's force momentum. In addition, the author argues that a transforming Army must balance efficiency and effectiveness to assure CSS units the necessary resources for mission accomplishment on the future asymmetric battlefield.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Operations, Combat Service Support, Force Protection	56
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
U	U	U	none

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

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Title of Monograph: Force Protection for Distribution Based-Logistics in Asymmetric Warfare

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ABSTRACT

FORCE PROTECTION FOR DISTRIBUTION-BASED LOGISTICS IN ASYMMETRIC WARFARE RAPH by MAJ Thomas M. Spenard, United States Army, 55 pages.

United States military operations in Iraq and Afghanistan demonstrate that adversaries are likely to persist in seeking advantage through asymmetric warfare. Within this context, emerging doctrine on Network Centric Warfare (NCW) and Effects Based Operations (EBO) must realistically apply to the U.S. Army, and more specifically, to Combat Service Support (CSS) leaders on the battlefield. In light of emerging doctrine, this monograph proposes necessary adaptations to force protection for Distribution-Based Logistics (DBL) under conditions of asymmetric warfare. Building on experience from Vietnam and contemporary operations in Iraq, this study examines the anticipated impact of the Joint Operational Environment (JOE) on CSS operations, including the key issue of tactical distribution. Among its conclusions, this study argues that the Army must insure that CSS leaders in the field have the ability to gain the required situational awareness to support and sustain the tactical commander's force momentum. In addition, the author argues that a transforming Army must balance efficiency and effectiveness to assure CSS units the necessary resources for mission accomplishment on the future asymmetric battlefield.

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The Problem

Asymmetric warfare seeks to avoid enemy strengths and concentrate comparative advantages against relative weaknesses. As the Global War on Terror (GWOT) progresses, current trends in Iraq and Afghanistan show that asymmetric attacks are likely to increase, even as the United States military maintains its conventional dominance. Meanwhile, an emerging strategy within Combat Service Support (CSS) transformation is Distribution-Based Logistics (DBL). This initiative aims to provide equal or better CSS capabilities with fewer unit resources and supplies through better distribution rather than through stockpiles of supplies. At the tactical level, DBL promises to affect CSS units by reducing the total combat zone footprint. However, under conditions of asymmetric warfare, force protection of these vital assets will become even more essential. This is the fundamental dilemma confronting planners and force developers: how to afford more protection with possibly fewer assets.

The United States military operations in Iraq and Afghanistan reflect the challenges that ground forces face in asymmetric warfare. The race to Baghdad during the initial stage of Operation Iraqi Freedom (OIF) caused combat units to operate on extended and unsecured lines of communication. This circumstance left (CSS) units vulnerable to enemy attacks. The enemy's firepower and ambush tactics caused significant disruption of convoys with critical supplies for the combat forces.

Tactical CSS sustains force momentum by focusing resources both to support the commander's intent and concept of operations and to maximize freedom of action. The challenge to future leaders within sustainment units of action is simultaneously defeating asymmetric adversaries while also providing unimpeded combat service support to maneuver units for sustaining force momentum. The complexity inherent in CSS transformation is likely to magnify the force protection challenges for CSS units during tactical distribution. Simultaneously, the

CSS community must deal with the pitfalls inherent in "better business" practices and "just in time" logistics that seek efficiency over effectiveness. As *On Point*, a study of the U.S. Army during OIF, indicates, CSS transformation must meet a significant array of requirements:

> The CSS difficulties cross all aspects of Army operations – doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF). From the recent shift to "just-in-time" logistics to the training and equipping of CSS soldiers and units, the CSS community and the Army must rethink how they conduct operations. The current system emphasizes efficiency over effectiveness – from parts and supply distribution to the physical equipping of CSS units. In combat, however, effectiveness is the only real measure of success; many CSS units struggled to perform their mission due to "savings" realized in recent changes in organization, equipment, training, resources, and doctrine.[1]

The Focus and Method

This monograph studies tactical distribution by sustainment units during asymmetric warfare in the Joint Operational Environment (JOE). The treatment examines how doctrine, technology, equipment, and tactics, techniques, and procedures are likely to affect the way in which CSS units conduct force protection in the JOE. At issue is the changing nature of logistics structures and concepts of support that were developed for a Cold War Army and that continue to evolve to meet support requirements within an asymmetric warfare environment. Within this context, major questions include: Specifically, what is asymmetric warfare? What were the trends in the nature and level of enemy threat to U.S. Army logistics forces in Vietnam? What lessons can the U.S. military learn from operations in Iraq and Afghanistan for future doctrine? What procedures can the combatant commander at the operational level use to minimize the logistics footprint at the tactical level? What procedures, equipment, and training can U.S. military forces use to counter enemy threats to tactical distribution? The answers to these questions are likely to require changes in doctrine, training, techniques, procedures and

[1] Fotenot, Gregory, E.J. Degen, and David Tohn. *On Point, The United States Army in Operation Iraqi Freedom.* Fort Leavenworth, Kan.: Combat Sutdies Institute Press; Washington, D.C.: Headquarters, Department of the Army, 2004: xxviii.

equipment to improve tactical distribution in asymmetric warfare and to ensure force momentum for maneuver forces.

The approach to the problem begins with an overview of asymmetric warfare. This point of departure includes a review of current U.S. Army doctrine, as well as Joint doctrine on distribution. The next step in the research methodology involves a historical analysis of selected operations involving the United States military in the Vietnam War. The purpose of historical analysis is to determine the nature and dynamics of tactical distribution in asymmetric warfare and to evaluate lessons learned in order to aid the present transformation of the U.S. military. Against this historical backdrop, the next step reviews on-going operations in Iraq and highlights the impact of selected aspects of asymmetric warfare on logistical operations. There follows an examination of emerging doctrine and how logistical support to maneuver units must adapt to Network Centric Warfare (NCW) and Effects Based Operations (EBO) in the Joint Operation Environment. The treatment subsequently extends to a discussion of how "sense and respond" logistics affects distribution-based logistics in order to reduce the logistics footprint on the battlefield. Sense and Respond Logistics (S&RL) uses information technology to sense consumer needs and to respond adaptively to demands for sustainment.[2] The intent of DBL is to provide the same or better support through demand-driven distribution rather than through stockpiles of supplies held and transported by units. Within this conceptual context, NCW and EBO are likely to have a substantial impact on logistics units and how these units conduct force protection. Future Units of Employment (UE) will have Maneuver Enhancement (ME) Brigades that are combined arms organizations that can be tasked organized according to mission requirements for freedom of maneuver on the battlefield. The ME brigades, however, will not be fixed

[2]. *Operational Sense and Respond Logistics: Co-evolution of an Adaptive Enterprise Capability*. Concept Document Department of Defense Office of Force Transformation. Washington, D.C.: November 2003: 18.

organizations and a mix of additional capabilities must be added, depending on the operation.[3] As operations become more noncontiguous and nonlinear, and as the CSS footprint becomes smaller with DBL, leaders must adapt their force protection measures. Adaptation affects not only CSS units, but also maneuver units that may face operational pauses as sustaining operations are delayed, or as the maneuver units are tasked to provide forces for a Tactical Control Force (TCF) or tailored ME Brigades.

The Force Protection Emphasis

Meanwhile, as Army transformation continues, force protection remains an important issue, not only for maneuver elements, but also for CSS. Force protection is defined as the actions taken to prevent or mitigate actions against personnel, resources, facilities, and critical information and those actions that conserve a force's fighting potential, so it can be applied at the decisive time and place and incorporate the coordinated and synchronized measures to enable the effective employment of the joint force while degrading opportunities for the enemy.[4] The force protection challenges for distribution discussed in this monograph focus on the actual movement of supplies on the battlefield rather than on measures taken within the base camp. Security of lines of communication is certainly not new, but becomes even more challenging as adversaries look for the softer targets of sustainment units on the asymmetric battlefield.

[3] *Army Comprehensive Guide to Modularity, Version 1.0,* U.S. Army Training and Doctrine Command. Fort Monroe, VA.: October 2004: 1-15.

[4] Chairman of the Joint Chiefs of Staff. *Joint Publication 1-02, Department of Defense Dictionary of Military and Associated Terms.* Washington, D.C.: U.S. Government Printing Office, 1997: Updated 2004, 209.

II. THE BACKDROP: ASYMMETRIC WARFARE AND DISTRIBTUION BASED LOGISTICS WITHIN DOCTRINAL CONTEXT

Asymmetry

Field Manual (FM) 3-06 defines asymmetry as the dissimilarities in organization, equipment, doctrine, capabilities and values between other armed forces (formally organized or not) and U.S. forces. Engagements are asymmetric if forces, technologies, and weapons are different, or if a resort to terrorism and rejection of more conventional rules of engagement are the norm.[5] Although *Joint Doctrine Publication 1-02* (Dictionary of Military and Associated Terms) does not define asymmetry, the 1999 Joint Strategy Review notes that:

> Asymmetric approaches are attempts to circumvent or undermine U.S. strengths while exploiting U.S. weaknesses using methods that differ significantly from the United States' expected method of operations. (Asymmetric approaches) generally seek a major psychological impact, such as shock or confusion that affects an opponent's initiative, freedom of action, or will. Asymmetric methods require an appreciation of an opponent's vulnerabilities. Asymmetric approaches often employ innovative, nontraditional tactics, weapons, or technologies, and can be applied at all levels of warfare – strategic, operational, and tactical – and across the spectrum of military operations.[6]

Others have defined asymmetry as acting, organizing, and thinking differently than opponents in order to maximize one's own advantages, exploit an opponent's weaknesses, attain the initiative or gain greater freedom of action.[7] In *Asymmetrical Warfare*, Roger Barnett discusses the challenges that the U.S. military currently faces. He contends that it is simply too trivial to assert that emphasizing one's strengths and exploiting an enemy's weaknesses are what differences in strategies are all about. True asymmetries are those actions that an adversary can exercise and that the U.S. military either cannot or will not. Such actions pose grave difficulties

[5] Chief of Staff, U.S. Army. *FM 3-06 Urban Operations.* Washington, D.C.: Headquarters, Department of the Army, 2003. Glossary.

[6] Chairman of the Joint Chiefs of Staff, *Joint Strategy Review 1999*, Washington, D.C.: U.S. Government Printing Office, 1999: 2.

because one cannot respond with offsetting tit-for-tat actions that are impossible at worst and problematic at best; the difficulty is that asymmetrical attacks and defenses lean toward the countercultural.[8] It is not feasible for the United States military to resort to techniques that are used by enemy forces in Iraq, including beheading hostages, operating from religious shrines, or using innocent civilians as human shields. More to the point, Vice Admiral Arthur Cebrowski (USN Ret.) and Thomas Barnett observe:

> In short, the rise of asymmetrical warfare is largely our own creation. We are creating the mismatch in means as we increasingly extend the reach of our warfighting machine down the range of conflict – past the peer competitor, past the rogue nation-state, right down to individual enemy combatants.[9]

Asymmetric warfare encompasses a wide range of theory, experience, conjecture, and definition, but the implicit premise is that asymmetric warfare deals with unknowns, with surprise in terms of ends, ways, and means.[10] Perhaps the best way to view asymmetric warfare is through the classic action-reaction-counteraction cycle, in which an enemy studies U.S. doctrine and attempts to counter it with the unexpected. U.S. forces recognize the asymmetry and counter it and so forth.[11]

Impact on a Transforming CSS

Whatever the challenge, the military must develop a means to conduct sustainment operations on the asymmetric battlefield in order to ensure force momentum for the joint force commander. The enemy that the U.S. faces in current operations will likely continue to strike at vulnerable forces. Colonel Larry D. Harman writes:

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[7] Metz, Steven and Douglas V. Johnson II. Asymmetry and U.S. Military Strategy: Definition, Background, and Strategic Concepts. Carlisle, PA: U.S. War College Strategic Studies Institute, 2001: 5.

[8] Barnett, Roger W. *Asymmetrical Warfare: Today's Challenge to U.S. Military Power.* Washington, D.C.: Brassey's Inc., 2003: 16.

[9] Cebrowski, Arthur K. and Thomas P. M. Barnett, "The American Way of War," *Proceedings of the U.S. Naval Institute*, January 2003, pp 42-43.

[10] Ancker, Clinton J. III, and Michael D. Burke, "Doctrine for Asymmetric Warfare," *Military Review*(July / August 2003): 18

[11] Ibid, 18.

> An astute enemy could determine that the ways and means of sustaining U.S. maneuver forces have not improved enough to keep up with our ability to maneuver and fight asymmetrically. Said differently, the Army's sustainment rhythm may not match its desired maneuver battle rhythm. If this is true, our Army needs remedies, or a determined enemy will attack the predictable U.S. vulnerability: our ability to sustain a deployed, highly maneuverable fighting force.[12]

Field Manual 4-0 provides the authoritative doctrine by which the Army's combat service support sustains full spectrum operations. The purpose of CSS is to generate and sustain combat power and to expand the commander's operational reach.[13] Combat Service Support reach operations involve the operational positioning and efficient use of all available assets and capabilities from the industrial base to the soldier in the foxhole.[14] CSS operational reach both converts operational art and science into an operations enabler for the force commander and sustains force momentum.[15] Force momentum, as a force multiplier, significantly increases the combat potential of a force and thus enhances the probability of successful mission accomplishment. Momentum lobbies against the force commander utilizing tactical pauses for logistical purposes.[16]

Today's logistics structures and support concepts were developed for a Cold War Army that relied on distinct linear support structures and predictable requirements.[17] Support requirements generated large stockpiles of materiel at each echelon of support to produce a large and robust logistics tail. In order to manage the large stockpiles, the Department of Defense infused more civilian and contract workforces into CSS deployments. The result was a military force that was not sufficiently adaptive or agile to sustain force momentum for the contemporary joint force commander, as was the case during the early stages of OIF.

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[12] Larry D. Harman, "Asymmetric Sustainment: The Army's Future" *Army Logistician* (July / August 2003): 39.

[13] Chief of Staff, U.S. Army, *FM 4-0 Combat Service Support.* Washington, D.C.: Heaquarters, Department of the Army, 2002: 1-1.

[14] Chief of Staff, U.S. Army, *FM 3-0 Operations*, Washington, D.C.: Headquarters, Department of the Army, 2001: 12-1.

[15] Ibid, 12-1.

The emphasis on asymmetric warfare in such locales as Iraq and Afghanistan requires Army responsiveness to a wide range of threats. Army forces must be agile and adaptive during full spectrum operations and missions, while expending fewer resources and minimizing the CSS footprint.[18] The challenge is to balance efficiency with effectiveness. S&RL will attempt to transform logistics with a focus on speed and effectiveness rather than on the efficiency of domain operations.[19] To meet this requirement, the Army has begun the transition from a supply-based to a DBL system. The intent of DBL is to provide equal or better CSS capabilities with fewer unit resources and supplies via better distribution, rather than via stockpiles of supplies held and carried by CSS units.[20] A critical element of effective DBL, through reach, requires knowing as quickly as possible when and where resources are needed, including whenever these needs change before delivery is complete.[21] Therefore real-time, complete, and precise information becomes vital to enhance the distance and duration over which a unit can successfully employ military capabilities.[22]

Field Manual 4-0 characterizes DBL as replacing bulk and redundancy with velocity and control to include visibility, management, and transportation of resources flowing to supported forces, as well as the information systems, communications, physical and resource networks of the distribution system. One critical aspect of a distribution-based system involves centralized management using distribution management centers to maximize efficiency for support commands. Other aspects include maximum use of throughput, the use of configured loads to

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[16] Joint Publication 1-02, 209.
[17] Ibid, 209.
[18] *FM 4-0 Combat Service Support:* 1-11.
[19] *Operational Sense and Respond Logistics: Co-evolution of an Adaptive Enterprise Capability:* 18.
[20] Peltz, Eric, John Halliday, and Steven Hartman. *Combat Service Support Transformation: Emerging Strategies for Making the Power Projection Army a Reality.* Rand Corporation Study: Santa Monica: 2003: x.
[21] Ibid, 56
[22] Ibid, 56

facilitate throughput, and the scheduled delivery of resources at agreed-on time intervals between CSS and maneuver units.[23]

The military services are responsible for the support of their own forces, except when otherwise directed by the Department of Defense or combatant command directives, plans, orders, or when provided for by agreements with national agencies, services or other nations. The combatant commanders use their directive authority for logistics to assign to the lead service Common User Logistic (CUL) support requirements. Usually the service component that is the dominant user or the most capable organization for a particular item becomes the lead service. Lead service directives may require the Army to plan and provide significant CUL support to other service components, multinational partners, governmental agencies, and nongovernmental agencies.[24] CSS units will normally deploy tailorable early-entry functional modules during the early stages of force projection in order to meet the CUL requirements.[25] These modular organizations that are currently being developed will expand in the future as necessary to provide the proper level of support for each operation or operational phase to maintain force momentum.

The challenge that leaders face is to ensure that sufficient force protection is afforded these modules as they deploy into a theater of operations. Leaders at all levels of command must ensure a situational understanding of the environment in which they are operating. CSS leaders cannot be successful in the Joint Operational Environment without situational understanding. Situational understanding flows from an analysis and assessment of the common operational picture to determine relationships among the factors of Mission, Enemy, Troops, Time, Terrain and Civil Affairs (METT-TC). It is situational understanding that enables the CSS force to focus

[23] *FM 4-0 Combat Service Support*: 1-11.
[24] Ibid, 2-15.
[25] Ibid, 2-27.

a distribution-based system responsively to meet the needs of the operational commander.[26] Both awareness of what is available and the ability to direct it to where it is needed at the appropriate time require total integration of all elements of the CSS system, to include active and Reserve Component Army, joint, multinational, civilian and other agencies.[27] To address this issue, the U.S. Army's Combined Arms Support Command (CASCOM) has emphasized the following concepts: updating doctrine and reshaping force structure; designing and fielding technological enablers that will equip the future force; and transforming training programs. These are the conceptual foundations of the distribution-based logistics system, and they are discussed in further detail in subsequent chapters.

Persistence of Legacy

The challenge is to conduct distribution-based logistics in a current asymmetric environment that promises to severely tax these concepts. Over half of the CSS assets in the U.S. Army are located in the U.S. Army Reserve (USAR) or National Guard Bureau (NGB).[28] Because of a low priority in the Department of the Army Master Priority List (DAMPL), many of these CSS units were not properly resourced prior to OIF/OEF to perform their wartime mission. This was due in part to the tiered-resourcing system used by the Army. Tiered resourcing means providing higher levels of warfighting resources to units in accordance with DOD's long standing "first to fight, first resourced" policy.[29] The Army assigned Authorized Levels of Organization (ALO) to units commensurate with their primary mission and the required availability dates from

[26] U.S. Department of the Army Training and Doctrine Command. *TRADOC Pamphlet 525-53 Operational Concept Combat Service Support.* Fort Monroe, VA: U.S. Government Printing Office, 1997: 1-16.

[27] *FM 4-0 Combat Service Support*: 1-67.

[28] http://www.defenselink.mil/ra/documents/annualreports/DoDTotalForce.pdf

[29] *How the Army Runs*, United States Army War College, Carlisle, PA, 2001: 8-4.

war plans.[30] *How the Army Runs*, a manual produced by the United States Army War College on the development and sustainment of landpower, states:

> Distributing scarce resources in DAMPL sequence allow the Army to optimize the readiness value of its asset where the risk or probability of conflict is greatest or where the least flexibility and time exist to correct shortages.[31]

During operations in OIF and OEF, the CSS community relied heavily on USAR and NGB assets to meet mission requirements. As these units were activated for service, the Army provided the resources to meet their equipment shortages. However, years of lower priority on the DAMPL produced equipment shortages or precluded the latest models of equipment. Under a DBL regime, this disparity in equipment would make force protection even more difficult for USAR/NGB CSS units. This paper is not intended to compare active and USAR/NGB CSS readiness, but rather to indicate that sustainment units are fielded with equipment at various ALO levels across the asymmetric battlespace.

Adversaries of the United States will probably continue to employ unconventional warfare to negate friendly technological superiority and to strike softer targets. Under these circumstances, and as lines of communication become more vulnerable, a warrior ethos must continue to flourish in CSS units. The battlespace may also become larger, creating a still greater dichotomy between force protection and mission support. These and other challenges will no doubt mandate additional changes in doctrine, methods of training, techniques and procedures and equipment.

III. ONE IMPORTANT HISTORICAL PRECEDENT: VIETNAM

The asymmetric challenges that the United States military faces today in Iraq and Afghanistan are certainly not new. Many of them resemble challenges that the U.S. military faced in Vietnam. There, soldiers faced imminent danger from “guerrilla forces” that employed

[30] Ibid, 8-4.

rocket-propelled grenades (RPGs), booby-traps with improvised explosive devices, and ambushes of logistical convoys with AK-47 assault rifles and other light weapons. As the Viet Cong and North Vietnamese forces struck at the vulnerable CSS structure, the ability to re-supply and maintain force momentum was a significant problem for the U.S. military in Vietnam. In retrospect, the ability to recognize and consciously think about asymmetric warfare would have been essential to any kind of meaningful response. Although the U.S. was confronting an asymmetric foe, conventional military forces lacked the vocabulary and intellectual constructs to consciously articulate the nature of the challenge and responses to it.

Background: The Nature of the Challenge

In *The Logic of Failure*, Dietrich Dorner identifies the roots of catastrophe and the small "sensible" steps that set the stage for disaster. Dorner believes that there are general behavioral tendencies that characterize people in situations fraught by uncertainty, complexity, and lack of clarity. If nothing else, the United States experience in the Vietnam War was characterized by uncertainty, complexity, and lack of clarity. President Johnson's administration and the Joint Chiefs of Staff did not fully grasp the complexity of Vietnam and thus failed to address the fundamental problem in the Republic of Vietnam: Asymmetric warfare as embodied in a Viet Cong-inspired insurgency that was abetted by powerful external forces.

Complexity is defined in *The Logic of Failure* as the existence of many interdependent variables within a given system. According to Dorner, if one is to operate within a complex and dynamic system, one has to know not only what the current status is, but also what the status will or could be in the future; one also has to know how certain actions taken will influence the situation.[32] Dorner states that it is essential to have clear goals in mind before forming judgments and arriving at decisions. The Joint Chiefs of Staff had precious few clear goals and little

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[31] Ibid, 8-5.
[32] Dorner, Dietrich. *The Logic of Failure.* Cambridge, MA: Perseus Books, 2001: 38.

guidance in preparation for the Vietnam conflict. Secretary of Defense Robert McNamara provided the following chilling guidance for the military: "Policy is: anything that will strengthen the position of the Government of Vietnam will be sent."[33] Thereafter, the JCS pushed for full mobilization for the war in Vietnam. The service chiefs wanted to avoid "the doctrine of gradualism" that would deploy just enough American troops to avoid a disaster, but not enough to pose a threat to North Vietnam.[34] This philosophy helped lead to what Dorner calls the development of failure: "failure does not strike like a bolt from the blue; it develops gradually according to its own logic".[35]

According to Dorner, the main issue is that people fail to approach problems from a systemic perspective. They tend to focus on one problem while neglecting the complex interrelationships comprising and impacting the system. The United States was fighting the war as a "state on state" conflict rather than as an insurgency within South Vietnam supported by external actors. Dorner states that people dealing with complexity act in a ritualized way that means they do not have to start from scratch to determine the best course of action.[36] However, this approach can be very damaging and lead to a crippling conservatism known as "methodism." Dorner borrows the term "methodism" from Carl von Clausewitz. Clausewitz observed: "so long as no acceptable theory, no intelligent analysis of the conduct of war exists, routine methods will tend to take over even at the highest levels."[37] In the absence of clear guidance from the administration, the JCS resorted to the "method" that had worked so well in World War II, which involved full mobilization for a "state on state" war. Under Secretary of State Nicholas Katzenbach poignantly observed in June 1967, that the North Vietnamese Army was "the key"

[33] Perry, Mark. *Four Stars*. Boston, MA: Houghton Mifflin Company, 1989: 149.
[34] Ibid, 161.
[35] Dorner: 10.
[36] Ibid, 170.
[37] Ibid, 170.

and that the U.S. "should recognize that pacification is not the ultimate answer – we have neither the time nor the manpower."[38]

By not breaking the complex goal down into partial goals, the United States condemned itself to what Dorner calls "repair service" behavior.[39] The United States began to search out things that were malfunctioning and, once they were discovered, the immediate goal became fixing whatever was broken. For example, the Republic of Vietnam, headed from 1954 to 1963 by Ngo Dinh Diem, was venal, reactionary, inefficient, and corrupt. The United States attempted to "fix" the incompetence, corruption, and oppression of the Diem administration by having him removed from office by a military coup.[40] However, the problem remained. Within the government of South Vietnam corruption, nepotism, extortion, and incompetence remained the norm afterwards with various leaders all the way through to President Thieu in the 1970s. A province chief might be removed here or there and replaced with a more competent and honest leader; however, the same problems would continue. The top leadership of the government and army remained as dependent as ever on the United States. The Saigon government remained a network of cliques, held together by American subsidies, a group of people without a coherent political orientation, bent on their own survival.[41] The heavy handed and corrupt government of South Vietnam actually made the countryside fertile for the insurgency of the Viet Cong and the communist.

President Johnson and the Joint Chiefs of Staff did not fully embrace pacification early in the war. When the administration attempted such programs later, it was too late. The Viet Cong had gained too strong a foothold, and security had become too large an issue for the programs to work effectively. The Johnson administration could have perhaps avoided its own "failure of

[38] Spector, Ronald H. *After Tet.* New York, NY: The Free Press, Maxwell Macmillan International, 1993: 189.
[39] Dorner: 59.
[40] Perry: 130.
[41] Spector: 100.

logic" if it would have heeded the advice of President Kennedy in 1962, when he addressed the cadets at West Point: "This is another type of war; war by guerrillas, subversives, assassins, war by ambush instead of combat, by infiltration instead of aggression, seeking victory by eroding and exhausting the enemy instead of engaging him… it requires, in those situations where we must counter it… a whole new kind of strategy, a wholly different kind of force."[42]

CSS Practice and Doctrine in Vietnam

The challenges that the U.S. military faced with attacks on logistical operations and convoys in this "type of war" were documented in a comprehensive study dating to 1971. The Army Concept Team conducted an evaluation of convoy operations in the Republic of Vietnam during the period December 1970 through March 1971.[43] The evaluation analyzed and assessed the organization and procedures employed in vehicle convoy operations by the U.S. Army in Vietnam. The intent was to determine if applicable doctrine were being followed.

The conclusions of the study were: transportation units did not possess the capability to perform proper vehicle maintenance and to meet convoy requirements; transportation units did not have adequate organic security vehicles; land clearing, road paving, and aviation support provided effective means of countering the ambush threat; personnel and equipment losses due to mines posed a major problem and, in general, applicable doctrine was followed.[44] However, the key questions were: 1) whether the "applicable doctrine" was appropriate for fighting asymmetric warfare; 2) and whether forces were sufficiently trained and equipped.

The United States military in the 1960s accepted the linear battlefield as its point of departure for logistical doctrine. Combat service support soldiers predictably operated behind the Forward Line Of Troops (FLOT). In conventional wars, including World War II and Korea, the

[42] Spector: 188.

[43] U.S. Army Final Report, *Vehicle Convoy Operations in the Republic of Vietnam*, Army Concept Team in Vietnam Project Number ACG-78F, 1971: ii.

[44] ACTV Project ACG-78F: ii.

vast majority of military convoy operations were conducted behind friendly Lines Of Communication (LOC). This circumstance afforded relative safety from attack by enemy ground forces (direct, sabotage and ambush), aircraft, and indirect fire.[45] Despite a new emphasis on air mobility, the United States military in Vietnam initially operated with a linear doctrine. Although the U.S. Army took measures to respond to the methods of the Viet Cong (VC) and the North Vietnamese Army (NVA), these measures did not change linear support doctrine.

Within a Cold War context, North Atlantic Treaty Organization (NATO) commanders planned a defensive campaign and assumed they would have a traditionally linear front, while host nations accepted responsibility for protecting vital rear areas back to the ports.[46] However, as the VC coordinated their actions with the actions of the North Vietnamese regular forces, Vietnam soon produced a situation that essentially eliminated the distinction between the front and the rear. For the U.S., Vietnam became the first modern war in which rear areas were exposed to similar actions as combat units on a daily basis.[47] The situation necessitated a reevaluation of the methods and techniques for security and operating logistics convoys in such a battlespace.

CSS Training, Techniques, and Procedures in Vietnam

At the height of the Vietnam War, the Support Commands of the United States Army, Vietnam (USARV) provided support for more than one million troops dispersed over an area of 66,000 square miles.[48] Airlift was generally used for emergency and priority movement of

[45] ACTV Project ACG-78F: I-3.
[46] Wass de Czege, Huba and Jacob D. Biever. "Force Protection: From Fort to Foxhole." *Army Magazine*, June 2001: 17 .
[47] Olinger, Mark "Vietnam – Supply Operations and Security Lessons Learned" *Quartermaster Professional Bulletin* (Summer, 1998): 38.
[48] ACTV Project ACG-78F: I-3.

limited quantities of supplies; rail or canal networks were available only in certain areas and were limited in their utility; therefore, motor transport was the primary means of moving supplies.[49]

The U.S. Army transportation units figuring in the Army Concept Team study were those that were assigned to major support commands and responsible for conducting a large volume of convoys in support of major logistical complexes and a few divisional transportation units with large convoy missions. The preferred method of supplying combat forces during the war, from a doctrinal viewpoint, was ground convoy, augmented by aviation support.[50]

The VC and NVA would carefully select ambush sites to attain a decided advantage while disadvantaging the ambushed unit. The VC or NVA commander conducting the ambush would consider sites located on uphill grades, curves, heavily wooded areas, defiles and narrow roads, all of which would slow the pace of the convoy, restrict the maneuver space for vehicles, and allow the ambush unit to cover open areas and gain the initiative immediately.[51] Convoy ambushes allowed the enemy to choose the time, place, and method of attack. These inherent advantages increased the odds in the adversaries' favor, unless U.S. forces took counter measures to benefit from any inherent enemy weakness.[52] In essence, the enemy would conduct deliberate ambushes only when all factors based on intelligence were in his favor. Otherwise, the risks would simply be too great.

The VC, in addition to convoy ambushes, used improvised explosive mines and booby traps to harass, impede and demoralize U.S. forces. The VC used emplaced munitions as an effective weapon and were very resourceful in making maximum use of all explosive ordnance at their disposal.[53] The Viet Cong would police the battle area for unexploded munitions, modify them, and use them as mines or booby traps. The lack of technical sophistication employed in the

[49] ACTV Project ACG-78F: I-3.
[50] Olinger: 38.
[51] ACTV Project ACG-78F: B-1.
[52] ACTV Project ACG-78F: B-1.

manufacture of these devices rendered them all the more dangerous. The improvised explosive devices, or IEDs in today's vernacular, came in many sizes, shapes and forms. They were constructed of light metal, cast iron, cement, or explosives packed into bamboo tubes or wrapping paper.[54] The intended use for a particular mine normally governed its size, shape and construction. One type was made from U.S. artillery and mortar projectiles. The projectile fuse was removed and a hole drilled into the explosive to accept a different fuse, which when rigged, would detonate by either command or pressure.[55] When this method was employed in an anti-vehicular role, a "slap-stick" firing device was most often used. This device consisted of two wooden slats or pieces of bamboo, two blocks of wood, two metal contacts, rubber strips, a battery pack, and an electric blasting cap with wire. When a vehicle passed over the device, the two metal contacts came together, completing the electrical circuit, which fired the electrical basting cap and main charge.[56]

The Army Concept Team study described one example of the tactics used by the Viet Cong. An antitank mine was command-detonated on the access road to a forward support base. Three friendly soldiers were killed and 28 were wounded. The capture and subsequent interrogation of a suspected accomplice indicated the mine was an improvised, 40-pound, wood-encased anti-tank mine, emplaced under the paved surface of the road by removing base rocks from the shoulder of the road directly above a culvert and digging an inclined hole to the desired location. The hole had then been filled with rocks, dirt, and liquid asphalt, and the mine was command-detonated from a position 100 meters from the road. The mine had been emplaced

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[53] United States Military Assistance Command, Vietnam. *Counterinsurgency Lessons Learned Number 53: Viet Cong Improvised Explosive Mines and Booby Traps*. September 1966: 1.

[54] Ibid, 1.

[55] ACTV Project ACG-78F: II-76.

[56] ACTV Project ACG-78F: II-76.

during the day, the activity concealed by a large group of Vietnamese civilians loitering in the area.[57]

The methods that U.S. forces used to address IEDs varied from unit to unit. Surveillance of routes, land-clearing, interdiction, the Volunteer Informant Program, and detection and detonation methods were all procedures used in countering IEDs.[58] Surveillance techniques included helicopter over-flights, security elements patrolling the routes, and ARVN outposts staggered along the route. Land clearing involved clearing both sides of a route for a hundred meters to serve as a deterrent to enemy ambush activities. Interdiction methods included: ARVN ambush patrols along routes and likely avenues of approach; both manned and mechanical ambush flank sweeps; and artillery aerial bursts. The resources available to the units largely determined the varying success of both surveillance and interdiction. The Volunteer Informant Program was a countrywide Military Assistance Command Vietnam (MACV) program to encourage Vietnamese civilians to volunteer useful information on enemy activities for monetary rewards in order both to decrease the enemy capability to employ IED along LOCs and to create anxiety and uncertainty among the enemy over his own security. Detection methods included visual means by "point men" at the front of formations, mine detectors such as the AN/PRS-7 or the AN/P-153, and mine dogs. Units reported that dogs were effective in locating trip wires and mines, but were not effective after rain. The detonation method included the use of mine rollers to clear routes. The detonation method was successful on occasion; however, the enemy could neutralize the effectiveness of the rollers by correctly applying offset fuses. Although the U.S. attempted to counteract the IED measures employed by its adversaries, the Viet Cong benefited from long and successful experience in improvising and employing explosive mines and booby traps, using whatever material – man-made or natural – that was available.[59]

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[57] ACTV Project ACG-78F: II-80.
[58] ACTV Project ACG-78F: II-80.
[59] *Counterinsurgency Lessons Learned Number 53:* 1.

Along roads used by U.S. forces, the VC/NVA gained support of the local populace through a show of force and made maximum use of native knowledge of the terrain, intelligence, planning, and camouflage techniques.[60] Necessary intelligence included route and time of movement of the convoy, type of indirect fire support available for the convoy, the weapons, disposition and response time of the reaction forces, and the state of training of U.S. forces.[61] By using the element of surprise, the enemy attempted to compensate for the firepower and mobility of the U.S. forces; however, properly trained U.S. units, when applying proven techniques, often overcame the initial surprise of the ambush force, minimized friendly losses, and defeated the enemy forces.[62]

In an attempt to offset enemy actions, U.S. forces implemented their own measures. Planners and convoy commanders would identify the likely or possible sites for an ambush by prior reconnaissance. They would ascertain where previous ambushes had been initiated along the route, as well as annotate defiles, chokepoints, curves, steep grades, and areas of dense vegetation favoring attacks. In addition, armored vehicles were placed at the likely ambush sites, ready to react while the convoy passed, and then "leap frogging" the convoy to the next likely ambush site. In addition, vehicle intervals were increased as the convoy approached possible ambush sites to avoid exposing a greater number of vehicles in a kill zone.

Another form of convoy security involved the use of aviation. Logistics units found that the enemy was reluctant to attempt convoy interdiction when air cover was present. However, due to large demands on aviation assets, air cover over all convoys was impossible, and aviation units reported that gun-ships (helicopters equipped with weapon systems) usually were provided only on an on-call basis.[63] Aviation served as a convoy control platform from either fixed or rotary-wing aircraft. Aircraft afforded convoy commanders the capability of detecting ambushes,

[60] ACTV Project ACG-78F: I-1
[61] Ibid, II-41
[62] Ibid, II-41

calling gun-ships or artillery to extricate a convoy from an ambush, and providing communications assistance.[64] Some of the problems, however, with using aviation assets included: poor coordination between the supporting aviation unit and the supported ground unit; the need for coordination of definite points for changing radio frequencies or to denote a handoff of responsibility; ground fire from convoys using .50-caliber machineguns that caused ricochets considered dangerous to supporting aircraft; and confusion stemming from the failure to uniformly name or number common ground checkpoints.[65]

Another type of security measure for convoys was the use of strongpoints. In the highlands of Vietnam, strongpoints were established along the Minh Than Road. Each morning a designated heavy force would conduct a sweep of the route and then return to the strongpoint to remain on alert for reaction to enemy action in its sector.[66] Enemy troops, however, quickly exploited the use of this technique, as they would mine all logical locations after a sweep and cause U.S. forces to lose vehicles.[67] Strongpoints were also labor intensive to maintain during 24-hour operations. Therefore, units soon switched to convoy escorts.

In addition to various forms of convoy protection, aviation played another important role in Vietnam. As the war progressed, U.S. units with greater mobility, such as air cavalry or airmobile infantry, were often supplied entirely by air.[68] If combat forces moved less often, they were initially supplied by air at a firebase and later by ground if roads were available, accessible, could be cleared of mines, and secured.[69] Combat units would carry sufficient supplies during

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[63] Ibid, II-42
[64] Ibid, II-42
[65] Ibid, II-42
[66] Ibid, 38-44
[67] Ibid, 38-44
[68] Olinger, 38.
[69] Ibid, 38-44

movements in order to execute missions immediately. Upon relocation to a new firebase, stocks were increased or replenished by later supply deliveries.[70]

CSS Equipment in Vietnam

Changes in tactics, techniques, and procedures required the U.S. military to make changes in the equipment and technology used to address the measures taken by the Viet Cong. Security elements for combat service support unit convoys were taken from internal hauling assets or were provided by either Military Police or tactical commands. One of the most innovative measures for security in Vietnam was the use of the gun truck. Gun trucks were not resourced by the Army, but were improvisations by units to provide their own organic security vehicles. These vehicles saved countless lives and often enabled American and allied forces to operate successfully in various regions of Vietnam.[71] Gun trucks provided overwhelming firepower for protecting supply and ammunition convoys along routes that traversed mountain passes and other vulnerable positions favoring enemy ambushes.[72]

During the Vietnam War, the Army was responsible for transporting and sustaining land forces in country from coastal ports to inland locations.[73] Initially, U.S. forces used automatic rifles, grenade launchers, and machineguns mounted on jeeps to protect convoys. However, over time, the enemy's firepower and ambush tactics improved, causing serious disruption of convoy movements, often with substantial loss of life.[74] This challenge resulted in the development of various techniques, including the gun truck, to better protect the convoys and to defeat the enemy.

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[70] Ibid, 38-44

[71] Paul S. Gardiner, "Gun Trucks: Genuine Examples of American Ingenuity" *Army Logistician* (July/August 2003): 34.

[72] Ibid, 34.

[73] Ibid, 34

[74] Ibid, 35

Headquartered at Qui Nhon, Vietnam in 1967, the Army's 8th Transportation Group usually is given credit for development of the gun truck.[75] After numerous devastating ambushes, the unit removed several of its two-and-half ton trucks from regular convoy operations and outfitted them with sandbags on the floors and sides for protection; later, the sandbags were removed in favor of locally fabricated steel armor plate.[76] Automatic weapons were placed in the vehicle, and its crew consisted of a driver, two gunners, and a noncommissioned officer in charge.[77]

Units with gun trucks that used three-quarter-inch armor plating soon realized it was insufficient for protection by itself against rocket-propelled grenades (RPGs). Units therefore used various fillers to prevent the spray of molten metal. Wood, when used to line the interior of the plating, effectively stopped the ricochet of armor-piercing rounds and fragments resulting from the penetration of RPG rounds.[78] Another method for armor plating a cargo truck was to strip an M113 Armored Personnel Carrier (APC) and mount it on a truck bed. This method was faster than fabricating armor plating, but offered less protection. Also, the weight of the APC body and its position in the truck resulted in raising the truck's center of gravity, which reduced its maneuverability.[79]

With the added weight of armor plating, weapons, and ammunition, the two-and-half ton trucks eventually proved underpowered for the maneuvering required. Units then made the switch to five-ton cargo trucks.[80] Many of the units also made modifications that included mounting .50-caliber machine guns instead of M-60 machine guns, as well as adding a 7.62-millimeter "mini-cannon," which could fire thousands of rounds per minute.[81] Some units added

[75] Ibid, 34
[76] Ibid, 35
[77] Ibid, 35
[78] ACTV Project ACG-78F: II-21.
[79] Ibid, II-21.
[80] Gardiner: 35
[81] Ibid, 35

three radios for soldiers to communicate with air cover, camps, and artillery. Cargo loads included over 10,000 rounds of ammunition for the two .50 caliber machineguns and the two 7.62-millimeter mini-cannons.[82] Though no accurate figure exists for the number of gun trucks developed and used in the Vietnam War, it is estimated that between 300 and 400 cargo trucks were modified for force protection.[83]

Unfortunately, many of the benefits derived from the gun trucks and other field expedient measures were not incorporated into doctrine for the organic security of CSS units. In the final report of Vehicle Convoy Operations in the Republic of Vietnam (ACTV Project Number ACG-78F), the Army Concept Team in Vietnam recommended in 1971 that an armored car, or similar vehicle, with multiple weapon systems, be developed specifically to provide organic convoy security.[84] The ACTV was not the only organization that recommended the use of security vehicles for CSS units.

Major General Joseph M. Heiser, Jr. commanded the 1st Logistical Command in 1969 and was responsible for the resupply of all U.S. Army forces in Vietnam. In August of that year, he submitted a memorandum through United States Army Vietnam to the Department of the Army requesting that organic armored vehicles be added to transportation units for organic security escort during movement and to increase the efficiency of convoy operations in order to better support the tactical units in Vietnam.[85] In the memorandum, MG Heiser explained that the use of "hardened" vehicles such as gun trucks with each 8 to 10 vehicles in a convoy column had been "beneficial," even with their disadvantages. One disadvantage was that the use of cargo vehicles for internal convoy escorts degraded the lift capability of transportation units. Another was that the continuous use of the armored task vehicles accelerated wear out and increased maintenance

[82] Ibid, 35
[83] Ibid, 34
[84] ACTV Project ACG-78F: ii.
[85] Memorandum by Major General Joseph M. Heiser, Jr, 1st Logistics Command, dated 5 August 1969.

problems because of the additional weight and increased stress factors for which the vehicle was not designed. A third disadvantage was that the personnel manning the crew-served weapons were exposed to enemy return fire within the gun trucks.

MG Heiser recommended that serious consideration be given to the inclusion of four XM-706 armored vehicles to the tables of organization and equipment for both medium and light transportation truck companies. The XM-706 was very similar in design to the current M1117 Armored Security vehicle that is assigned to military police units today (2004). The request was eventually rejected by the Department of the Army, based on a USARV recommendation that the armored cars be assigned to the military police companies.

Return to Normalcy

Although U.S. forces gained valuable lessons and established effective measures to meet the asymmetric challenges they faced in Vietnam, after the war the U.S. Army had little need for organic gun trucks or armored vehicles for convoy security. Focus in doctrine returned to the Cold War, and a linear battlefield mindset in which asymmetric warfare dropped from view.

IV. OPERATIONS IN IRAQ AND AFGHANISTAN

Normalcy Unhinged

The adversaries that the United States military faces today in Iraq and Afghanistan are similar in many ways to the Viet Cong of 30 years ago. Both groups used or are using asymmetric means to counter superior technological and numerical forces and both demonstrated the will to expend human life to achieve their aims. The lessons that the U.S. Army learned in Southeast Asia have been used to some extent in OIF and OEF. However, doctrine, equipment, and training, techniques, and procedures need review and updating for the current battlespace. CSS units in OIF and OEF have performed admirably under austere, challenging and demanding conditions to distribute required supplies to combat units. However, CSS units are often the

targets in asymmetric warfare, as enemy forces avoid combat units and focus on the supply convoys that support them. Convoys are excellent targets for enemy forces since they can inflict maximum casualties and damage in a short period of time and with little or risk to themselves. An opportunistic enemy goal is to cause the U.S. maneuver force to "consume" itself faster than U.S. sustainers can regenerate the forces lost combat power.[86]

Field Manual 3-0 warns that adversaries will develop warfighting doctrine that asymmetrically accounts for perceived U.S. strengths and vulnerabilities and prevents projection of U.S. forces by controlling the nature and the tempo of U.S. actions.[87] Adversaries continue to profit from complex terrain, urban environments, and force dispersal methods, such as those used by the VC and NVA, to offset U.S. advantages. Current adversaries are using IEDs, RPGs, mortars, and AK-47 fire to ambush and disrupt sustainment operations.

One direct countermeasure involves a change in attitude and posture. Every soldier, regardless of military occupational specialty, must also be prepared to operate as an infantryman.[88] CSS units have always balanced the demands of mission support and force protection.[89] As demonstrated by current events in Iraq and Afghanistan, logisticians can no longer adhere to a linear mindset. In non-contiguous operations, there is no longer a "rear." Asymmetric warfare has caused CSS soldiers to deal with many of the same challenges that combat arms soldiers face, including engagement in combat. CSS soldiers in today's environment face the asymmetric tactics of a hostile paramilitary force and irregulars, often posing as friendly civilians.[90] During the Cold War, an anticipated linear style of warfare defined the combat zone as extending from the rear battle area forward. The calculus associated with this

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[86] Larry D. Harman, "Asymmetric Sustainment: The Army's Future," *Army Logistician* (July/August 2003): 39.

[87] *FM 3-0 Operations*: 1-28.

[88] Hill, David C. and Shaun E. Tooke. "2-5 FA: A Ground Maneuver Force for the 3d ACR in OIF." *Field Artillery* (September / October 2004): 27.

[89] Norton, Timothy Norton, "Force Protection in the Future." *Army Logistician* (July / August 2002): 12.

definition allowed CSS leaders to mitigate risk and the exposure of CSS personnel and equipment.[91]

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In contrast, the CSS soldier now has the dual mission of sustaining the force and ensuring force protection. Confronting CSS soldiers are the challenges to become more lethal, survivable, and responsive in supporting current and future operations. These challenges were all aptly demonstrated during operations of the 240th Quartermaster Battalion in Operation Iraqi Freedom. The 240th Quartermaster Battalion had to protect 15 isolated pump stations, including numerous tactical petroleum terminals, while patrolling and protecting over 220 miles of the Inland Petroleum Distribution System to ensure fuel for decisive operations.[92] During the execution of this mission, the leaders of the unit soon realized that the Modified Table of Organization and Equipment (MTOE) lacked essential requirements. Soldiers of the unit had to operate in harm's way without sufficient equipment or external support.[93] Armed fuel theft and saboteurs were daily threats to the unit. To discourage such activities, the unit had to conduct extensive patrols along the line. External support from other military forces was simply not available because of other mission requirements.[94] The soldiers on pipeline patrol were equipped with crew-served weapons, but had to improvise weapon mounts and borrow night vision goggles and global positioning systems from other units. These items were not authorized by the MTOE.[95] In addition to patrolling, the soldiers of the 240th had to maintain their equipment, conduct base defense, and sustain the force with fuel. The 240th showed that CSS units do get into the fight and must be properly equipped and trained to decisively engage and defeat the enemy while

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[90] Mann, David Scott. "Every Soldier a Rifleman." *Army Logistician* (January / February 2004): 46.

[91] Ibid, 46.

[92] Ibid, 11.

[93] Ibid, 11.

[94] Ibid, 12.

providing support.[96] In similar environments of the future, CSS forces must be properly manned, equipped, and trained if they are expected to sustain the force and maintain force momentum.[97]

Prominent among the asymmetric threats that U.S. forces face in Iraq is the IED. Iraq is one of the most heavily mined nations in the world. In early 2003, it was estimated that over 10 million mines already lay in the ground from previous conflicts with Iran and from Operation Desert Storm / Desert Shield, as well as from conflicts with the Kurdish population in northern Iraq.[98] Over time, the proficiency and frequency of insurgent attacks have increased. IEDs currently provide the greatest threat to U.S. convoys in Iraq because of the predictability of traffic patterns and friendly and coalition movements. Between 40 and 60 percent of all attacks against U.S. forces in Iraq begin with an IED detonation. Following the IED explosion, there is usually some form of direct fire attack.[99] Many IEDs in Iraq have been placed in median strips, tunnels burrowed under roads, cement-encased bomb projectiles, cardboard boxes, soda cans, and even dead animal carcasses.[100] Many of the IEDs are remotely detonated using relatively simple, readily available low-technology devices, including garage door openers, car alarms, cellular telephones, pagers, and toy car remotes.[101] These devices confer a standoff capability that permits insurgents to watch U.S. forces from a distance without fear of compromise. Primitive measures used in Iraq are similar to measures used in Vietnam, and they allow the enemy to inflict severe casualties on U.S. forces short of direct engagement.

Asymmetric attacks on CSS units in Iraq and Afghanistan have caused many units to adapt and improvise. When possible, units have included armor combat vehicles such as the M1 or M3 in their convoys. Units have hardened their wheeled vehicles with sandbags and armor

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[95] Ibid, 12.

[96] Walsh, Shawn P. "More Tooth for the Tail: The Right Stuff for CSS Operations." *Army Logistician* (January / February 2004): 11.

[97] Norton: 14.

[98] http://www.globalsecurity.org/military/intro/ied-iraq.htm

[99] Ibid

[100] Ibid

plating. Units have also configured five-ton cargo trucks and Heavy Expanded Mobility Tactical Trucks (HEMTTs) to serve as gun trucks. However, despite efforts to accelerate the production of armor plate and up-armored High Mobility Multipurpose Wheeled Vehicles (HMMWVs), the U.S. Army cannot supply enough protective kits to equip nearly 50,000 trucks now operating throughout Iraq.[102] Meanwhile, tanks and Bradley Fighting Vehicles are too cumbersome to maneuver within urban areas and are considered too intimidating within the context of rebuilding operations.[103]

The vulnerability of truck convoys and the inadequacies of the Army supply system are among the painful lessons learned in the war in Iraq.[104] As was the case in Vietnam, CSS soldiers have made modifications to their equipment for self-preservation. The Army's current truck fleet was designed for the Cold War on the assumption that logistics vehicles would operate safely in the rear behind a linear battlefield.[105] With soldiers now under constant fire or threat from IEDs, they have resorted to numerous improvised vehicle modifications on trucks that were never designed to carry the additional weight of force protection expedients. The additional weight subjects trucks to a beating by breaking down suspensions and other components.[106]

Units in Iraq have used aviation assets for overwatch and security of convoys, as well as for firepower augmentation of committed forces. Other measures in which aviation assets are used in Iraq and Afghanistan include: to reconnoiter and determine trafficability of convoy routes, and to reconnoiter built-up areas and locate bypasses as necessary. Limited numbers of aircraft in theater impact their availability for convoy operations. In addition, integrated training and the incorporation of aircraft into standard operating procedures (SOP) for convoy operations remain

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[101] Ibid

[102] Erwin, Sandra I. "Truck Crews Get Crash Course in Survival." *National Defense* (April 2004): 21.

[103] Ibid, 21

[104] Ibid, 21

[105] Ibid, 21

[106] Ibid, 21

just as critical as they were in Vietnam. Though aviation assets are a limited commodity, they should be incorporated into force protection measures on the asymmetric battlefield.

As CSS transformation continues, the appropriate balance of personnel and equipment in CSS units must be examined in order to ensure efficiency without compromising effectiveness. The combined drumbeat of transformation and asymmetric warfare requires CSS soldiers to fully embrace the mantra, "every soldier a rifleman."[107] As cultural transformation takes hold, other requirements will persist, including the incorporation of tactics, techniques, and procedures, and emerging lessons learned into pre-deployment training. Other requirements include updating of CSS mission training plans to incorporate squad and platoon-level tactical training, and the development of theater-specific validation training to operate effectively and efficiently in the Joint Operational Environment.[108]

V. FUTURE OPERATIONS IN THE JOINT OPERATIONAL ENVIRONMENT

New Approaches

The end of the Cold War in 1989 dramatically changed the international environment and the security threat for the United States. The following year the United States military demonstrated its superiority with a resounding victory over Iraq in Operation Desert Storm. Adversaries of the United States realized that they could not achieve victory, let alone compete, in a traditional conventional war. This realization in part caused adversaries to revert to asymmetric measures, including attacks on the United States by Al Qaeda on September 11, 2001. The challenge the military has faced in light of post 9/11 developments has required further adaptation to these threats.

[107] Thurmond, Suzi. "Analyzing the Lessons of OIF Distribution." *Army Logistician* (July / August 2004): 5.

[108] Ibid, 21

In 2004, the United States Joint Forces Command (USJFCOM) prepared the White Paper on the Joint Operational Environment (JOE) in response to the Defense Planning Guidance (DPG) Strategic Tenet:

> Adopt a capabilities-based approach. U.S. defense planning will focus less on where and when a conflict will occur and more on the broad set of capabilities U.S. military forces need to deter, deny, and defeat adversaries who will rely on surprise, deception, and asymmetric warfare to achieve their objectives.[109]

This paper is updated annually and serves three purposes: to describe processes, procedures and relationships used within the USJFCOM training, experimentation, and doctrinal development communities; to establish a framework for thinking about threat capabilities and environmental influences on modern conflict; and to identify points of reference necessary for guiding the capabilities-based model for force development.[110]

The JOE is important to military leaders because it provides a framework for preparation to win in a future conflict against an adversary that applies asymmetric measures. The JOE addresses constants that military leaders must deal with in future conflicts. They are: constant change, perpetual energy, and motion; a constant race with the enemy for killer applications that will cause immense changes in future conflict; a constant hate that fuels the motivations and activities of the adversary; a constant anxiety that comes with the flux and dealing with the unknown; and the constant fog and uncertainty that occur with every encounter with the adversary.[111]

The Army is responsible for providing a campaign-quality force with joint and expeditionary capabilities for the regional combatant commanders to meet requirements in the JOE.[112] CASCOM is developing a single, integrated, responsive end-to-end distribution system that encompasses joint logistics capabilities to support the full range of military operations for the

[109] USJFCOM Joint Operational Environment, March 2004.
[110] USJFCOM JOE, 6
[111] USJFCOM JOE, 133

joint force commanders. In light of current operations in Iraq and Afghanistan, the military must continue to transform the conduct and sustainment of joint operations. Transformation requires military commanders to conduct operations in permissive, uncertain, and hostile environments that are routinely fluid, nonlinear, and noncontiguous. Highly-distributed forces operate at various tempos and phases of operations.[113]

The "campaign-quality" Army must have the ability to triumph in decisive combat operations and to sustain those operations while quickly adapting to unforeseen changes in the context and character of conflict.[114] The purpose of transformation for CSS units in the Army is to ensure that they are much more agile, flexible, and adaptive as they respond to unforeseen changes. An extensive support infrastructure with distinct, linear support structures, and predictable requirements is an outmoded legacy of the Cold War. To meet the challenges that arise from the emergence of the joint operating environment, the Army must alleviate gaps and seams and transform its sustainment system into a "continuous, fully integrated, globally synchronized, end-to-end distribution-based system" capable of providing responsive support to expeditionary joint forces during simultaneous operations in a nonlinear and noncontiguous environment.[115] The implication is that U.S. forces must avoid the kind of methodism or repair service behavior that was used in Vietnam. Yet, for U.S. forces to be effective, they must have the resources to perform their mission and must not rely upon improvised equipment.

Beyond equipment requirements, networks and network-centric operations will become critical in future conflicts. Network-centric warfare (NCW) describes a combination of emerging tactics, techniques, and procedures that a fully networked force can employ to create a decisive

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[112] Juskowiak, Terry E. and John F. Wharton. "Joint and Expeditionary Logistics for a Campaign-Quality Army." *Army Logistician* (September/October 2004): 2.

[113] Ibid, 2.

[114] Ibid, 3.

[115] Ibid, 3.

warfighting advantage.[116] NCW is an information superiority concept of operations that defines how U.S. forces organize and fight in the information age. NCW translates into combat power by effectively linking friendly forces within the battlespace to provide a shared awareness of the situation and to enable rapid and effective decision-making.[117] The Command and Control Research Program (CCRP) operates within the U.S. Department of Defense and views network-centric operations as a means to an end. Effects Based Operations (EBO) are that end.[118] According to Edward A. Smith of CCRP, "Effects-based operations focus on the mind of man. They are not a replacement for network-centric operations; rather they are the gateway to applying the tools of network-centric operations to the threat we now face, in an asymmetric conflict that must be won in the mind of man."[119]

The U.S. is not alone in EBO. Adversaries use variants of effects-based operations in today's conflicts in Iraq and Afghanistan. Effects-based operations are focused on actions and resultant links to behavior (stimulus and response) rather than merely on targets and damage infliction.[120] Effects-based operations are defined as coordinated sets of actions directed at shaping the behavior of friends, foes, and neutrals in peace, crisis and war.[121] Effects-based operations perceive an adversary comprised of complex, interrelated systems that use all elements of power within reach to create actions leading to desired effects on those systems.[122] Still, effects-based operations are not entirely new. Successful general officers and statesmen have always emphasized outcomes in the human dimension of war by focusing on will and shock, among other objectives.[123]

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[116] Force Transformation, Office of the Secretary of Defense (www.oft.osd.mil)
[117] Ibid
[118] Smith, Edward A. *Effects Based Operations – Applying Network Centric Warfare in Peace, Crisis and War*. Department of Defense Command and Control Research Program, Washington, D.C.: 2002. xx.
[119] Ibid, xxxvi.
[120] Ibid, xiv.
[121] Ibid, xiv.
[122] USJFCOM JOE: 140.
[123] Smith: xiv.

Network-centric warfare and effects-based operations are not the panacea for everything that ails the military as it transforms to meet the current JOE. NCW and EBO will not replace all older forces and forms of warfare, but rather the novel will open some new warfare niches even as it closes others.[124] NCW and EBO are intended to enhance the impact and effectiveness of military force in a tactical, operational, or strategic context.[125] The challenge for combat service support leaders is to meet the operational needs of the combat forces in a turbulent, nonlinear environment with no secure rear areas.

The Logistics Response

In the past, the logistics community built "iron mountains" of supplies in support of operations. This was certainly the case in 1990-1991, during Operation Desert Shield and Operation Desert Storm. The accumulation of massive stocks, however, remains time and resource intensive. This method was effective, but not efficient. Later in the 1990s, the Department of Defense (DOD) implemented "just-in-time" logistics in an attempt to apply commercial practices to "lean-out" the inventory and make the logistics system more efficient.[126] Just-in-time logistics worked well, some would argue, in peacetime, but becomes very vulnerable in a dynamic environment because of inflexibility, susceptibility to damage and destruction, and the potential inability to service prioritized needs generated by change.[127] Such problems were manifest in logistical support during the early stages of OIF. The lesson was that traditional CSS relationships, with wholesale and retail orientations and breaks between providers at various levels of war, must be transformed into a seamless CSS continuum.[128] To meet the logistical

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[124] Ibid, xxxiii.
[125] Ibid, xxxi.
[126] *Operational Sense and Respond Logistics: Co-evolution of an Adaptive Enterprise Capability:* 4.
[127] Ibid
[128] *FM 4-0 Combat Service Support.* 1-65.

requirements across the tactical, operational, and strategic levels of war, the Department of Defense is developing Sense and Respond Logistics.

The Department of Defense Office of Force Transformation defines Operational Sense and Respond Logistics (S&RL) as:

> …a transformational network-centric concept that enables Joint effects-based operations and provides precise, agile support. Sense and Respond Logistics relies upon highly adaptive, self-synchronizing, and dynamic physical and functional processes. It predicts, anticipates, and coordinates actions that provide competitive advantage spanning the full range of military operations across the strategic, operational, and tactical levels of war. Sense and Respond Logistics promotes doctrinal and organizational transformation and supports scalable coherence of command and control, operations, logistics, intelligence, surveillance, and reconnaissance. Implemented as a cross-service, cross-organizational capability, Sense and Respond Logistics provides an end-to-end, point-of-effect to source-of-support network of logistics resources and capabilities. Within Sense and Respond Logistics, every entity, whether military, government or commercial is both a potential consumer and a potential provider of logistics. It delivers flexibility, robustness, and scalability for Joint expeditionary warfare through adaptive, responsive, real-time, demand and support networks with U.S., allied and coalition operations.[129]

DOD is attempting to ground S&RL in network-centric warfare and Joint Adaptive Expeditionary Warfare practice. S&RL will use networks to support distributed and adaptive operations by: making logistics decisions continuously and anticipatory through network adaptation; emphasis on information and distribution that allows a greater degree of operational flexibility and risk management; preventing logistics-caused operational pauses that would impact operational speed.[130] S&RL begins with a common understanding that intelligence and operational and logistical capabilities are part of a cohesive and integrated network.[131] The "sense" function of S&RL is part of the ongoing intelligence and operational planning cycle and makes use of predictive evaluations gained through training, modeling, and anticipation of future

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[129] *Operational Sense and Respond Logistics: Co-evolution of an Adaptive Enterprise Capability:* 5

[130] Ibid, 6

[131] "From Factory to Foxhole – The Transformation of Army Logistics" Lexington Institute, Arlington, VA: 2004: 15.

actions based on battlespace situational awareness.[132] With continuous communications assets, CSS staffs at all levels determine the supplies or support necessary to conduct current and future actions and request all staffs to "respond" with their capabilities to meet the demand.[133] The SR&L concept uses both the common picture of the battlespace and the relevant logistical information base. The latter includes expenditure and readiness rates of maneuver units, as well as the total visibility of all supplies in theater and at depot or the industrial base, to make logistics decisions with a high probability of success.[134] The CSS community must continue to incorporate emerging technologies to collect, process, store, display, and disseminate information.[135] An important element of emerging technology includes improving the logistics operating picture with the Battle Command Sustainment Support System (BCS3) and eliminating legacy Standard Army Management Information Systems (STAMIS) through the development of Global Combat Support System- Army (GCSS-A).The challenge lies in assuring the interoperability of various legacy STAMIS with emerging systems such as BCS3. GCSS-A will eventually replace the legacy systems, but it is still under development and not fully fielded. In addition, the bandwidth requirements for these systems continue to restrict their full potential.

To work at the tactical level, or unit of action level, S&RL requires devolving logistical decision-making authority to lower levels. Devolution is possible only if all levels have the connective electronics to ensure a common understanding of the battlespace. CSS leaders of the future must be trained to operate in this environment. Self-synchronization and rapid adaptation should accelerate speed of execution at the tactical level and speed attainment of strategic objectives.[136]

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[132] Ibid
[133] Ibid
[134] Ibid, 16.
[135] *FM 4-0 Combat Service Support*: 1-69.
[136] Ibid, 15.

As the Army transforms from a supply-based to a distribution-based logistics system, theater distribution focuses on an end-to-end capability to deliver materiel from supply source to maneuver forces.[137] This focus requires the development of a theater distribution brigade that will have the mission, responsibility, and authority to conduct movement management functions. The brigade will be assigned functional as well as multifunctional battalions to perform transportation, supply, and services missions.[138] The distribution-based logistics system maximizes throughput from the theater hub to the user level, bypassing intermediate echelons that cut into speed and velocity of resupply operations and thwart force momentum.

As new doctrine emerges for maneuver forces, corresponding doctrine must change with reference to CSS forces. CSS doctrine must ensure that logisticians are "connected" to improve upon the modern theater distribution process. The Army's logistics transformation strategy must define a clear path to a joint logistics system that is seamless and retains a "campaign-quality robustness" to support the JOE.[139] This challenge will require a cultural change in how logistics are delivered on the battlefield. Logistics organizations must be tailored and scaled to sustain the simultaneous deployment, employment and sustainment operations that are required to support the joint force commander.[140] The modular Army enhances support to the joint operational environment. It must be resourced with the organic force protection requirements to meet the challenge.

As mentioned, a key component of CSS transformation to reduce the CSS footprint is modularity. Army Training and Doctrine Command (TRADOC) Pamphlet 525-53 defines modularity as a force design methodology that establishes a means to provide interchangeable, expandable, and tailorable force elements. CSS organization design must facilitate operations in a split-based configuration and employ information age technologies in order to be totally

[137] Juskowiak and Wharton: 4.
[138] Ibid, 2
[139] Ibid, 8

responsive to the joint task force commander. The intent is that these designed forces be more agile, capable, and easier to train.[141] The benefits of a modular structure mean that support capabilities can be phased into a theater of operations by sending modules independently of parent units until support requirements grow as a function of the mission profile criteria.[142]

Modularity is not new to the CSS community. It has been modular since the mid-1990s in order to provide tailorable support elements for specific mission requirements.[143] However, what is new about modularity is where CSS assets are located within the battlespace. The Army requires more self-reliant maneuver organizations that can conduct combat operations without being continuously "tethered" to higher logistic support echelons.[144] Distribution-based logistics can maximize throughput from the ports to the user level by bypassing intermediate supply bases when possible. The result is that CSS assets from the various echelons, for example in the Main Support Battalions of the Division Support Command or the Corps Support Groups, are being reorganized to meet the requirements of maneuver brigade combat teams (BCTs or units of action - UA) within the sustainment units of action.[145]

Force Protection Pay-Offs

A critical force protection method in theater will be to minimize the size and number of combat service support structures deployed forward. Technology will facilitate more support from outside the combat zone. Future forces must minimize dependencies on predictable and fixed facilities and choke points by generally reducing the presence, in time and space, of CSS organizations and "iron mountains." The restructuring of divisions from brigades to units of

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[140] Ibid, 3

[141] U.S. Department of the Army Training and Doctrine Command. *TRADOC Pamphlet 525-53 Operational Concept Combat Service Support.* Fort Monroe, VA: U.S. Government Printing Office, 1997: 4-4.

[142] Manns, Gregory A. "Modularity: Reducing the Logistics Footprint." *Army Logistician*. (May / June 2003): 28.

[143] Juskwoiak and Wharton: 4.

[144] Ibid

action will assist commanders in establishing a battle rhythm during mission staging. Mission staging is a programmed period of time during which units might refit, resupply, plan, and rest in preparation for their next mission.[146] This method would allow combat service support units to focus upon specific units for a given time. Logistics forces would be active only in specific places and at specific times; space would be secured only for relatively brief periods, while routes and air corridors would open and close only as required.[147]

Unit agility and unit capacity will be at a premium in an expeditionary, noncontiguous environment. The tactical commander should gain a greater level of operational freedom and maneuver with the "self-sufficiency" that modularity provides. However, the Army needs to ensure that logistics assets do not inhibit the commander's maneuver flexibility. This dilemma requires the Army to develop a solution that balances the additional logistics support needed for BCT self-reliance with the tactical commander's requirement for freedom of action and mobility.[148] As part of the answer, CSS units must have the assets and ability to provide their own force protection against asymmetric threats. The objective is that the tactical commander does not have to divert maneuver forces from decisive operations to protect CSS assets. If the force that conducts sustaining operations does not have sufficient force protection, the decisive operation could easily fail.

At the same time, modularity is essential for the ongoing evolution of distribution-based logistics. As mentioned earlier, DBL is about providing the same or better support through efficient distribution, rather than through large stockpiles. The faster and more reliable the distribution process becomes, the more the Army can reduce the need for inventory in maneuver units and the combat zone.[149] Reducing the need for inventory will reduce requirements for

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[145] Ibid
[146] Wass de Czege and Biever: 19.
[147] Ibid
[148] Juskowiak and Wharton: 2.
[149] Rand Corporation CSS Transformation, 55

resources to hold the inventory, which, in turn, reduces the need for containers and vehicles, the personnel to operate them, the personnel to maintain the vehicles and support the operators, and so forth.[150]

A critical aspect of effective DBL is having the ability to "sense" in order to "respond" to the logistical requirements of the BCT. In other words, the CSS community must know as quickly as possible when and where resources are required, as well as any changes that may arise before supplies are pushed to the maneuver force. The quicker the logistics system knows a demand, and the more precisely and accurately it knows the logistics status, the less inventory needs to be held in forward units.[151] The more effective the entire system's inventory can be managed, the more effective the Brigade Combat Team can be supported without increasing total inventory. Rather than have additional stock on-hand as a buffer to account for uncertainty, better information becomes a measure to ensure adequate stockage levels. In addition, distribution based logistics doctrine has tremendous potential with regard to force protection. Lower stockage levels require fewer CSS personnel to handle inventory, and the logistics footprint is decreased. This development makes CSS soldiers less vulnerable, since they will not be required to push supplies as frequently.

To make the system work, distribution-based logistics will require the development of technological enablers that provide not only situational awareness and knowledge of the battlefield to augment EBO, but also assist with force protection measures. Enablers include such measures as improvements in information systems, pre-configured combat loads, precision guided aerial delivery systems, and unmanned aerial vehicles, all of which will assist in reducing the logistics footprint and serve as passive force protection measures.

[150] Ibid
[151] Ibid

Loose Ends

Distribution-based logistics requires information systems to provide real-time information. Some systems, such as Force XXI Battle Command Brigade and Below (FBCB2) and Movement Tracking System (MTS), are currently fielded in the Army inventory. FBCB2 provides real-time situational awareness to users (e.g., electronic maps with friendly forces, estimates of enemy forces, and operational graphic overlays), and the MTS monitors the location of vehicles to enable real-time, in-transit visibility of vehicles and cargo.[152] However, they are currently not fielded to all CSS units. Additionally, the Army has developed the Combat Service Support Control System (CSSCS) to enable CSS leaders to draw data from Standard Army Management Information Systems (STAMIS). This system was designed to result in near-real-time logistics resource status; however, the utility of such data was limited because of reliance on legacy STAMIS with batch processing and holes in data capture.[153] The Battle Command Sustainment Support System (BCS3) replaces CSSCS. BCS3 is the logistics slice that interoperates with the Army Battle Command System (ABCS) and other Army and joint systems. BCS3 displays the logistics portion of the Common Operating Picture (COP) on Maneuver Control System (MCS).[154] BCS3 is designed to collect and process selected maneuver sustainment data in a seamless manner from STAMIS and other related source data and hierarchical automated C2 systems, e.g., FBCB2. BCS3 currently interfaces with legacy STAMIS, including the Unit-Level Logistics System (ULLS-S4), the Standard Army Maintenance Systems Level 2 (SAMS-2), and the Standard Army Retail Supply System – Level 1 (SARSS-1). Global Combat Support System-Army (GCSS-Army) replaces the full range of the current transactional and unit logistics management systems.[155] The GCSS concept provides the

[152] Ibid, 56
[153] Ibid
[154] System Training Plan: Battle Command Sustainment Support System, Combined Arms Support Command, Ft. Lee, VA: Jun 2004: 1.
[155] Rand Corporation, CSS Transformation, 57

joint warfighter with a single, end-to-end capability to manage and monitor units, personnel, and equipment from mobilization through deployment, employment, sustainment, redeployment, and demobilization.[156] The intent is to provide interoperability, facilitate integration, and promote data sharing across the logistics community. The intent is also to replace many of the current STAMIS baselines. However, the current combat support environment does not fully achieve system interoperability and asset visibility because of several shortfalls. These include stovepipe information systems, lack of visibility, and an inability to present a common picture.[157] The development, fielding, and training on these systems will take time and delay immediate utilization. The projected success of DBL is based on information systems that must be further developed to enhance interoperability. However, at present neither the BCS3 nor the GCSS-Army is fielded throughout the Army. In the interim, the Army must mitigate force protection risks to CSS soldiers with available technology.

Bandwidth also constitutes an important stumbling block. Bandwidth is a term used in the telecommunications industry to measure the rate at which information moves from one electronic device to another.[158] CSS information technology that provides situational understanding for the resources on the battlefield must compete with other battlefield operating systems (BOS) for bandwidth. The civilian sector is able to meet the challenge of bandwidth by laying miles of fiber-optic cable. This solution for the most part is not available to an army on the move on the battlefield.[159]

In 2003, the Congressional Budget Office (CBO) conducted a study for the Subcommittee on Tactical Air and Land Forces of the House Committee on Armed Services that analyzed the current and future total demand for communications bandwidth to support

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[156] GCSS – Public Access Web Site: http://www.disa.mil/ge/gcss/gcsshome.html.

[157] Ibid

[158] *The Army's Bandwidth Bottleneck*. Congressional Budget Office (CBO) Study prepared for the Subcommittee on Tactical Air and Land Forces of the House Committee on Armed Services. August 2003. Available at http://www.cbo.gov/showdoc.cfm.

operations officers at all levels of command within the Army. The CBO analysis yielded severe conclusions. First, the current demand for bandwidth is so large that supply-shortfalls with a large order of magnitude (or up to 10 times the amount of supply) can exist.[160] Second, shortfalls will persist at various command levels through and after 2010, when the capabilities associated with the Army's transformation begin to appear in the field.

A Rand Arroyo Center Study on the Army's bandwidth problems indicated that OIF required 10 times the bandwidth demanded by the Gulf War, and that demand will continue to grow, resulting in an outstripped supply.[161] Both the CBO and Rand Arroyo study stressed that new technologies will greatly increase capacity, but that unchecked user demands will probably keep pace with, and exceed capacities. No single technique will solve the problem, and the challenge is to meet the right users' need at the right time.[162] Both studies stressed that bandwidth must be managed and allocated as an important combat resource. For example, during decisive operations, operational traffic would have bandwidth priority, but logistics traffic might gain priority during a sustainment phase of an operation in order to rearm or refit units. Command involvement and unit SOPs will have to address bandwidth concerns in the future to assure that distribution-based logistics becomes a reality. Without the situational understanding provided through automation, S&RL and distribution-based logistics simply become catch phrases like "just-in-time" logistics. In turn, failure of distribution-based logistics impacts force protection. CSS leaders may put soldiers at risk in unnecessary convoys as supplies are pushed to maneuver units or other supply units, only to produce additional handling requirements and cumbersome stockpiles.

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[159] Ibid.

[160] Ibid

[161] *Future Army Bandwidth Needs and Capabilities*, by Leland Joe and Isaac Porche III, MG-156-A. 2004. Available at http://www.rand.org/publications/MG/MG156

[162] Ibid

In addition to key information requirements, success in distribution-based logistics is dependent upon speed. Minimizing materiel-handling time at distribution system nodes can have a substantial impact on distribution time and force protection. Improved materiel-handling processes and equipment also reduce the logistics footprint. The industrial base can assist with the improvement of materiel-handling by constructing pre-configured loads tailored for particular units. These loads are prepared at a factory in the Continental United States (CONUS) or within a theater in the Area Of Responsibility (AOR) and delivered without reconfiguration. The less time that CSS soldiers in the AOR spend handling supplies, the less likely they are to become targets for attack. The result means enhanced support for the tactical commander with DBL.

The whole situation, however, becomes more complex when maneuver units must be sustained over long distances from support bases and without secure LOCs. Technology development in areas of precision aerial delivery and intra-theater lift become essential. One solution is the Precision Extended Glide Aerial Delivery System (PEGASYS), consisting of a suite of advanced parafoil systems with a variety of containers and a common computer navigational system.[163] These systems can be released from altitudes up to 35,000 feet and aircraft can be offset from the target as much as 25 miles to ensure security of delivery means.[164] Payloads up to 42,000 pounds can be delivered by PEGASYS to within 100 meters of designated targets. By using precision aerial delivery, PEGASYS bypasses traditional choke points, such as air and sea ports of debarkation, ground lines of communication, and transshipment and supply points to deliver supplies directly to the warfighter.[165] Such delivery assets minimize the CSS footprint and reduce force protection concerns for CSS units.

Another option is to use Unmanned Aerial Vehicles (UAVs) to make deliveries. Like PEGASYS, UAVs would allow CSS units to solve the tactical dilemma of providing food,

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[163] Juskowiak, Terry. "Maneuver Sustainment in a Transforming Army." *Army Magazine.* (April 2003): 20.

[164] Ibid

supplies, critical parts, or ammunition when the risk to ground logistics assets is too high.[166] The benefits of using unmanned resupply aircraft include the potential to reduce the risk to human life in combat operations, to reduce the logistics footprint in theaters of operations, and to improve logistics effectiveness.[167] Although improvements in current UAVs would be required, current models have the capability to deliver a cargo of 13 cases of Meals, Ready to Eat (MREs), with each case equaling 156 meals, weighing 221 pounds and occupying 10.8 cubic feet.[168] Improvements in UAV technology could greatly increase this capability and augment other means of delivery.

Force protection for CSS units involves more than the passive measures mentioned above. The basis of issue for equipment, as well as training requirements for CSS units, must continue to be reviewed and improved as required. In an attempt to capture important lessons learned during the Army's operations in OIF, CASCOM conducted a "rock drill" after action review (AAR) to identify numerous problems associated with in-theater distribution. The drill brought together logistician leaders from OIF, as well as senior leaders from logistics headquarters, to examine and resolve distribution challenges. Their findings underscored equipment and training deficiencies for CSS soldiers. The proper resourcing of CSS units with such equipment as night-vision goggles (NVGs), precision lightweight global-position-system receivers (PLGRs), and individual body armor (IBA) enhances survivability on the asymmetric battlefield.[169] During the rock drill, CSS leaders noted that soldiers had to share NVGs, and that there was a shortage of PLGRs for units in Iraq. These shortages caused some soldiers to buy their own Commercial Off-The Shelf (COTS) Global Position System (GPS)

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[165] Ibid, 21

[166] McCoy, John V. "Unmanned Aerial Logistics Vehicles – A Concept Worth Pursuing." *Army Logistician.* (March / April 2004): 40.

[167] Ibid

[168] Ibid

[169] Thurmond: 3.

because of inadequacies in unit MTOE.[170] The availability of IBA was also insufficient for CSS requirements in the AOR.

In asymmetric warfare, the "deep, close, and rear" battles no longer exist. The U.S. Army must re-examine its basis of issue plans for equipment. As combat continues in OIF and OEF or their successors, units deploying to the AOR must continue to have priority in fielding of equipment. Moreover, the U.S. Army must whole-heartedly assimilate the concept that "every soldier is a rifleman," and deal more effectively with the idea of fielding combat arms forces first. As the AAR for the OIF Distribution Rock Drill indicated, the U.S. Army needs to fix basis of issue plans and CSS unit MTOEs to include security and force protection equipment. In addition, as emerging technology in force protection becomes available, the CSS community must be incorporated properly into the BOIP. Some of the emerging technology, including unmanned aerial vehicles, jammers, passive armor, and blast mine protection will greatly assist CSS units, but communication systems will continue to be the backbone for the situational awareness to make distribution based logistics a reality.

Requirements

An important aspect that the CASCOM AAR emphasized was insufficient soldier training for convoy defense. Soldiers must be required to train as they fight in war. CSS soldiers assigned to divisions receive convoy "live-fire" training in which their convoys come under attack. CSS soldiers must respond by firing live rounds. CSS units do conduct live-fire exercises prior to their deployment into Iraq and Afghanistan. Soldiers learn how to fire from a moving vehicle, how to respond to various ambush techniques, how to identify IEDs, and how to prevent accidents while traveling in convoys. However, repetition is essential for all learning and training.

[170] Ibid.

Convoy live-fire exercises must be commonplace to all CSS soldiers. A soldier must be comfortable and confident while firing from a moving vehicle. The movement of the vehicle, bumps on the road, and spent cartridges bouncing from the weapon inside the vehicle increase the difficulty of such firing.[171] Additionally, training on crew-served weapons is just as important. A gunner on a .50-caliber machinegun or an MK-19 grenade launcher should know the full capabilities of the weapon system, including its ability or inability to take down targets.[172] Additionally, soldiers must be trained in combat driving through various types of terrain and at various speeds. Soldiers must have full confidence in themselves and their equipment. Too often CSS soldiers do not fully push the limits of their vehicles or their weapons. Additional training on convoy live-fire exercises is necessary to build confidence in equipment and self for the soldiers. Other methods to improve convoy training include the U.S. Army Operator Driving Simulator (ODS) and the Virtual Combat Convoy Trainer (VCCT). To train operators of trucks and heavy vehicles, there are currently 21 ODS simulators in the Army installed at Ft. Leonard Wood, Ft. Eustis, and Ft. Bliss, and in Germany, and Korea.[173] The ODS simulator offers a six level training curriculum from beginner through advanced tactical driver. The simulator tracks the drivers as they progress in skill level and presents more difficult scenarios as skill level warrants.[174] In contrast with numerous ODS, the U.S. Army currently possesses two VCCTs. The VCCT helps train troops to recognize and respond to potential convoy threats, including IEDs. Additionally, the VCCT enables combat crews to communicate, maintain situational awareness, and acquire targets while moving at highway speeds in a convoy environment.[175] The intent of the VCCT is to improve convoy tactics and to minimize combat related injuries and

[171] Stepp, Edward M. "Preparing for Convoy Operations in a Combat Zone." *Army Logistician*. (November / December 2004): 28.

[172] Ibid

[173] U.S. Army Operator Driving Simulator. FAAC Incorporated homepage. Available at http://www.faac.com/usaods.html

[174] Ibid

deaths resulting from attacks on convoys.[176] The VCCTs are currently located at Camp Shelby, Mississippi and Fort Bragg, North Carolina. Both the ODS and VCCT allow soldiers to hone the tactics, techniques, and procedures for operating vehicles in convoys.

VI. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Doctrine must reflect a realistic understanding of unit capabilities. Emerging doctrine from USJFCOM with reference to NCW and EBO must realistically apply to the Army and more specifically to CSS leaders on the battlefield. The intent of this paper is not to debate the utility or practicality of EBO, but to illustrate that the CSS community must be prepared to support effects-based operations and "sense and respond logistics" corresponding with the evolving JOE and emerging doctrine. However, "sense and respond" cannot become simply a catch phrase like "just in time," or distribution-based logistics may become the next footnote in the next *On Point*. For S&RL to become a reality and for implementation of distribution-based logistics, the Army must ensure that CSS leaders in the field have the ability to gain situational awareness and understand how to support and sustain the tactical commander's force momentum. The Army must not reduce the size or capabilities of support forces until the information systems are fielded that will provide awareness and understanding.

In the past, CSS units established massive stockpiles of supplies, as in Operation Desert Storm. This method was effective but not efficient and was sometimes referred to as "just in case" logistics. "Just-in-time" logistics eliminated the stockpiles and delivered the right stuff at the right place at the right time. This method was efficient, but not effective, because the right supplies did not always arrive at the right time or right place. S&RL attempts to balance

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[175] Virtual Combat Convoy Trainer (VCCT). Defense Update. Issue 4, 2004. Available at http://www.defense-update.com/products/c/convoy-trainer.htm.

[176] Ibid.

effectiveness and efficiency. The logistics challenge is not to improve the efficiency of sustainment operations, but rather to transform logistics for better response to needs, with an eye to speed and effectiveness. As noted earlier, complexity is the label given to the existence of many interdependent variables in a given system. If one is to operate within a complex and dynamic system, one has to know not only what the current status is, but also what the status will be or could be in the future.

Gaining situational awareness and understanding requires the designing and fielding of equipment and technology to enable the process. DBL is intended to provide the same or better support through distribution rather than through stockpiles of supplies held and carried by units. This development will require fewer soldiers and less equipment to handle materiel on the battlefield. The current STAMIS are too stove-piped and do not have the inter-connectivity to support this capability. Such systems as FBCB2 and GCSS-Army signify progress towards that ability. However, the current combat service support environment does not fully achieve system interoperability and asset visibility because of several shortfalls. These include stovepipe information systems, lack of visibility/limited access to other systems, lack of bandwidth, and an inability to present a common battlefield picture.

In the interim, while information systems to assist distribution-based logistics are developed, the Army must discard the linear mindset. There is no longer a rear area in asymmetric warfare, and "every soldier must be a riflemen." The U.S. Army must learn from the lessons of Vietnam and OIF as it addresses force protection in asymmetric warfare of the future. As evidenced by CSS units in Vietnam and the 240th QM Battalion in Iraq, the Army did not provide proper resources for force protection, and the units had to improvise equipment to ensure mission success. In addition, the Army did not resource units with sufficient quantities of equipment, including NVGs, Precision Lightweight GPS Receivers (PLGRs), and IBA. Shortages resulted in some soldiers purchasing commercial equivalents or borrowing equipment from other units. In addition, CSS units have had to improvise organic security vehicles from

their own lift assets. Improvisation results in fewer vehicles for distribution of supplies on the battlefield. Changes also degrade improvised vehicles with cumbersome additional weight and obscured lines of sight for un-programmed missions.

Recommendations

Sense and Respond Logistics must not become a slogan for an efficient and better business practice, but rather an effective means to provide unimpeded combat service support to maneuver units sustaining overall force momentum. BCS3 and GCSS-Army are essential for the logistic operational picture in the asymmetric battlespace. These systems afford the sensing of operational needs in real time and insure response to those needs within the time requirements of the commander. Anticipating and reacting to emerging requirements rely on information systems that interface with other ABCS assets. As a result, expediting the further development of BCS3 and the fielding of GCSS-Army become critical. BCS3 is the logistics slice interoperating with the Army Battle Command System (ABCS) and other Army and joint systems. BCS3 is designed to collect and process selected maneuver sustainment data in a seamless manner from STAMIS and other related source data and from hierarchical automated C2 systems. Failure to develop GCSS-Army will cause reliance on legacy STAMIS with batch processing and holes in data capture. Meanwhile, bandwidth is critical to the development of any interoperability among information systems. The Army must not only augment the infrastructure with necessary fiber optics, but also ensure that the precious resource of bandwidth is properly managed. Bandwidth becomes a leadership concern at all levels. Failure to ensure proper oversight will result in additional bandwidth simply being consumed by other systems as it becomes available.

Meanwhile, CSS units must provide protection for themselves as they maneuver within the asymmetric battlespace. Self-protection includes the fielding of necessary equipment such as GPS, NVGs, and IBA, and exploring the further development of UAVs for distribution. The concept of tiered resourcing among active, USAR, and NGB units must be re-evaluated, if not

completely abandoned. The Army is the only service that uses the ALO system, which causes a direct impact on unit status levels.[177] The Army must continue integrating its active, reserve and guard units. The total force concept must embrace the concept of "one team–one fight" across the spectrum with regard to basis of issue and DAMPL for CSS units. In addition, CSS units should have organic vehicles within their MTOE to replace improvised gun trucks that come from internal assets. A possible solution is to review the basis of issue of the Armored Security Vehicle (ASV) that some Military Police (MP) units already have in their MTOE. Perhaps some might be allocated to CSS units. The ASV is designed to support both peacetime and wartime mission requirements, including security operations, battlefield circulation control, and personnel transport.

Figure 1 - M1117 Armored Security Vehicle

As mentioned earlier, it would not be the first time that an organic security vehicle has been proposed for a CSS unit. The M1117 is very similar to the XM-706 that MG Heiser (as well as the Army Concept Team – Vietnam) recommended for CSS units over 35 years ago. The realities of OIF proved that CSS units do get into the fight and must have sufficient firepower

[177] *How the Army Runs*, 8-4.

while providing support to decisively engage and defeat adversaries.[178] As Lieutenant Colonel Walsh, Commander of the 240th Quartermaster Battalion during the initial phase of OIF, stated, "CSS units support priority corps and divisional warfighting units. However, theater-level CSS units typically are low priority for support, despite having vital missions. CSS units at all levels must become self-sufficient; failure is not an option during war."[179]

Finally, the continuous training of soldiers on convoy operations is essential. Tactics, techniques, and procedures (TTPs) flowing from OIF must continue to be captured by such organizations as the Center for Army Lessons Learned (CALL). Lessons from combat ensure that units can update their standard operating procedures in preparation for deployment. CSS live-fire exercises cannot be emphasized too much for sustainment units. ODS and VCCT simulators must be available for all units at their home stations. At a minimum, these simulators should be located at Combined Training Centers (CTCs) so that soldiers might improve convoy tactics and validate their SOPs prior to deployment.

All leaders within the Army must recognize how their response to transformation will influence force protection in asymmetric warfare. Inability to properly address doctrine, equipment and training for force protection in distribution-based logistics on the asymmetric battlefield will lead either to failure of the mission, or worse, needless soldier casualties.

[178] Walsh: 11.
[179] Ibid

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